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Experiments in evaporation.

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By C. B. RIDGAWAY.

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INTRODUCTION.

The two great questions which are of most importance to the agriculturist in this section of the country are: How may we best conserve and utilize the available water to the greatest advantage? and, How may we eliminate the surplus alkali from the soil?

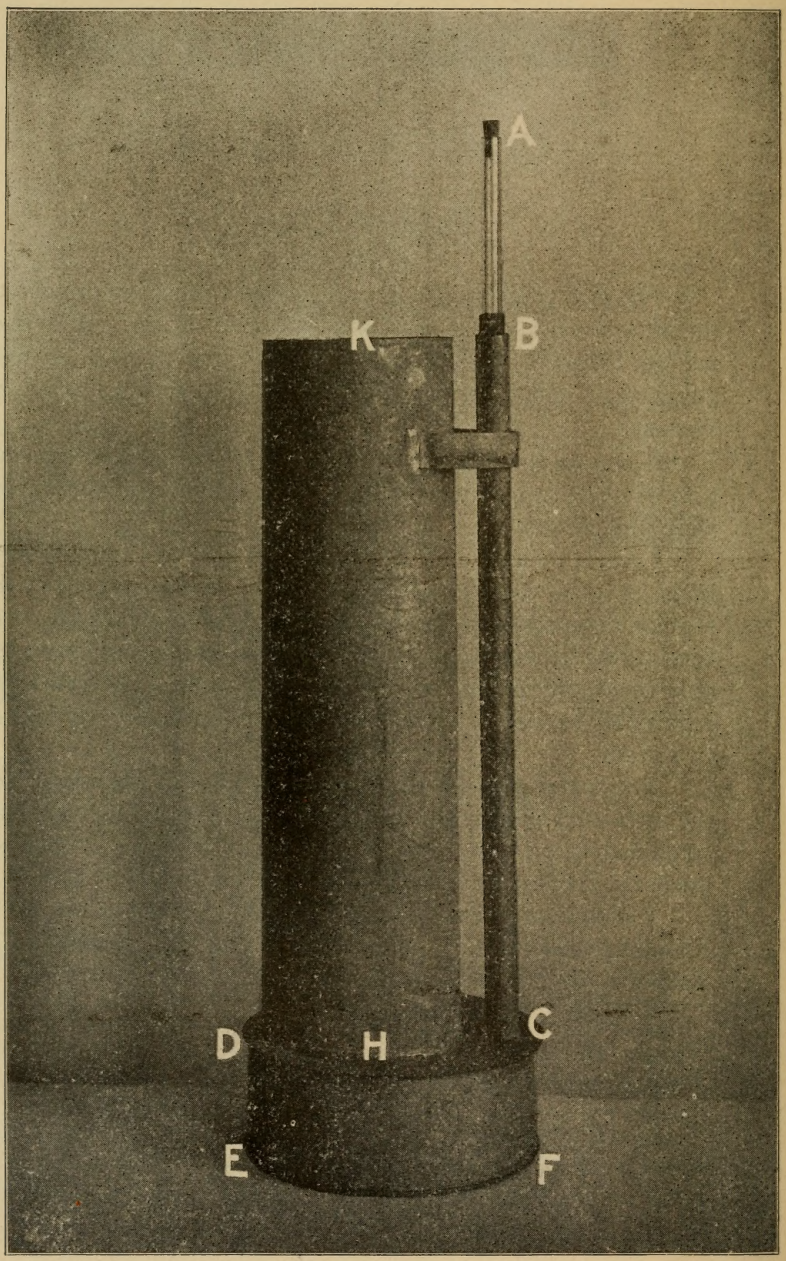
It was in the hope of throwing some light upon the solution of these great questions that the following experiments were undertaken.

I regret to state that the young man who took the observations for a few days, on account of the necessary absence of the regular observer, lost the records for two months of the year 1900. I have concluded, therefore, to use the records for 1901 only in reporting the amount of evaporation. The results in regard to the rise of alkali, however, will cover the period of two years.

The water used in these experiments was obtained from the artesian well near the University, and the amount of alkali contained therein was .639 grains per gallon as per analysis made by Professor E. E. Slosson, Chemist of the Station.*

I wish here to acknowledge my indebtedness to Mr. B. P. Fleming, Irrigation Engineer, for all of the data found in Table II.

*Bulletin No. 24, Wyo. Ag. Exp. Sta. Water Analyses.


A
K
B
D
H
C
E
F

Experiments in Evaporation.

The following were some of the questions which I hoped to partially answer by these experiments:

1. How rapidly does moisture evaporate from the soil when the level of water is kept at a certain distance from the surface by subirrigation?

2. What effect has stirring the soil once a week to certain depths upon the evaporation of moisture when the level of water is maintained at a constant depth?

3. What effect has subirrigation upon the rise of alkali?

4. What effect has alkali upon the evaporation of moisture when the level of water is kept at a certain depth from the surface?

For the purpose of investigating these questions I had constructed 15 pieces of apparatus similar to the one shown in the cut. D E F C is a drum, 9 inches in diameter and 4 inches deep, made of heavy galvanized sheet iron. K H is a tube of the same material, 26 inches long and 6 inches in diameter, extending to the bottom of the drum, and with its lower surface perforated with many holes so as to admit water freely from the drum.

This pipe was filled with soil in place on the experiment farm by driving the tube into the soil as far as possible, then with trowels and knives cutting the soil from around the tube and driving it down still further. The process was continued until the tube was entirely filled. The tube was then soldered into the drum around the rim at H.

The tube B C is of galvalized iron pipe soldered into the drum at C and fastened to the larger pipe by a support a little below B.

This apparatus was buried in the ground on the experiment plat so that the top of the tube H K was level with the surface of the soil. Thus I had the undisturbed soil from the farm buried in the ground with the top exposed to the wind, rain, and sunshine, and having the same temperature as the surrounding earth.

The tank, from which observations were taken of the amount of evaporation of moisture from the water surface, and the soil thermometers, for determining the temperature of the soil at various depths, were located about 16 feet from the buried tubes.

In the tube B C was put a small empty vial fitted with a rubber stopper. In the stopper was inserted an aluminum wire long enough to reach up to a certain mark on the glass tube B A when the vial was floating on the water kept at a certain level in the tube B C. The tube B A was calibrated so that 5.5 grams of water poured into the tube B C would cause the end of the wire to rise through one space. The upper end of the wire was bent at a right angle, and the lower end of the tube at B was almost closed by fusion, so that the pointer on the end of the wire could move up or down through the length of the tube but could not fall below the lower end B.

The level of water in the tube B C was kept at about the same height by pouring water from a graduate into the tube A B at 7 p. m. each day during the crop season of 1900. During the year 1901, the method of obtaining the amount of water used each day differed somewhat from the method used the previous year. A beaker nearly full of water was first carefully weighed, then enough water poured from it into the tube B C to bring the floating index up to the required mark; the beaker was again weighed and the amount in grams of water poured into the tube was ascertained and recorded. Very frequently the index would come above the proper mark, then an allowance had to be made for the excess poured in; an allowance also had to be made for the amount of evaporation the

next day. This, however, was very easily accomplished by means of the calibrated tube A B.

DATA IN REGARD TO THE DIFFERENT TUBES.

No. 1 was kept full of water to within 6 inches of the top.

No. 2 was kept full of water to within 12 inches of the top.

No. 3 was kept full of water to within 18 inches of the top.

No. 4 was kept full of water to within 22 inches of the top.

No. 5 was kept full of water to within 22 inches of the top and the surface stirred once a week to the depth of 2 inches.

No. 6 was kept full of water to within 22 inches of the top and the surface stirred once a week to the depth of 4 inches.

No. 7 was kept full of water to within 22 inches of the top and the surface stirred once a week to the depth of 6 inches.

In tubes 8, 9, 10, and 11 enough sodium carbonate in solution (5 per cent) was poured in A C to moisten each tube full of earth and leave the solution standing at the proper level, after which artesian well water was added each day. In tubes 12, 13, 14, and 15 a 10 per cent solution of sodium carbonate was added till all of the earth was moistened with the liquid, then water was poured in as in the other tubes.

No. 8 was kept full of water to within 6 inches of the top.

No. 9 was kept full of water to within 12 inches of the top.

No. 10 was kept full of water to within 18 inches of the top.

No. 11 was kept full of water to within 22 inches of the top.

No. 12 was kept full of water to within 6 inches of the top.

No. 13 was kept full of water to within 12 inches of the top.

No. 14 was kept full of water to within 18 inches of the top.

No. 15 was kept full of water to within 22 inches of the top.

In column 16, of Table No. I, the amount of evaporation from the free water surface will be found, while column 17 of the same table contains the amount of rainfall.

The amounts in Table No. I are recorded in linear inches, while those in Table No. II represent the per cent of alkali found in the soil at various depths.

The following conclusions were drawn from these experiments:

The evaporation from the surface of the soil with the level of water maintained at 6 inches below was 95 per cent, at 12 inches below it was 70 per cent, at 18 inches below it was 45 per cent, and at 22 inches below it was 35 per cent of what it was at the surface of the water in the evaporation tank.

Stirring the ground once a week to the depth of 2 inches retarded evaporation to the amount of 19 per cent, when stirred to a depth of 4 inches it was retarded 23 per cent, and when stirred to a depth of 6 inches evaporation was retarded 45 per cent. The water in all three of the pipes was maintained at a depth of 22 inches below the surface of the soil.

Evaporation was retarded 43 per cent when the soil contained .0597 per cent of alkali and the level of water was maintained at 6 inches below the surface. The amount of retardation was 55 per cent in soil containing .5116 per cent of alkali, and the level of water 12 inches below the surface. In soil containing .5375 per cent of alkali the amount of retardation was 50 per cent when the level of water was maintained at 18 inches below the surface; while the retardation was 57 per cent in soil containing .6205 per cent of alkali and the level of water kept at 22 inches below the surface. The amount of alkali is the average amount found in the entire 26 inches of soil.

More alkali was found in the first three inches than in any other three inches of the soil.

More alkali was found in the last two inches than in the three next above.

The following analysis of the soil used in these experiments was made by Professor E. E. Slosson in 1892, and published in Bulletin No. 6.

Chemical Analysis of the Soil of the Laramie Experiment Farm.

Analysis of fine earth.	Surface 1-9 in.	Subsoil 9-18 in.
Insoluble matter	80.11	77.28
Soluble silica	2.78	1.92
Potash (K_2O)	.60	.53
Soda (Na_2O)	.65	.45
Lime (CaO)	1.14	3.77
Magnesia (MgO)	.45	.08
Iron (Fe_2O_3)	2.79	2.49
Alumina (Al_2O_3)	4.95	4.71
Phosphoric acid (P_2O_5)	.14	.15
Sulphuric acid (SO_3)		.07
Carbonic acid (CO_2)	.69	3.70
Moisture	1.87	1.24
Volatile and combustible matter	3.21	2.82
	99.38	99.21
Soluble in water	.0829	.0464
Chlorine	.001	.001

TABLE 1—*Evaporation.* MAY, 1901.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
9	.232	.084	.167	.159	.067	.155	.281	.254	.130	.055	.030	.171	.046	.009	.000	.144	
10	.247	.256	.166	.029	.106	.060	.029	.253	.121	.055	.012	.066	.097	.015	.000	.288	
11	.221	.206	.142	.141	.000	.000	.004	.227	.109	.050	.022	.124	.086	.027	.000	.096	
12	.234	.190	.128	.140	.065	.030	.044	.129	.087	.050	.052	.128	.119	.060	.000	.108	
13	.237	.213	.137	.066	.038	.076	.108	.237	.107	.041	.090	.100	.065	.039	.021	.180	.020
14	.226	.215	.154	.182	.062	.066	.091	.200	.090	.041	.063	.085	.048	.081	.097	.120	
15	.076	.092	.066	.152	.040	.000	.022	.134	.052	.000	.000	.085	.000	.000	.000	.180	
16	.187	.145	.095	.058	.095	.000	.000	.219	.127	.024	.048	.131	.095	.024	.048	.144	.240
17	.251	.200	.123	.154	.080	.012	.260	.158	.077	.000	.108	.065	.051	.050	.000	.060	
18	.298	.209	.145	.182	.051	.077	.069	.283	.160	.068	.012	.144	.090	.054	.056	.252	
19	.281	.263	.315	.281	.092	.068	.000	.233	.166	.052	.000	.152	.115	.079	.057	.324	
20	.356	.270	.226	.177	.124	.108	.043	.200	.108	.059	.281	.339	.084	.059	.110	.240	
21	.401	.286	.333	.263	.093	.000	.054	.314	.128	.071	.097	.113	.093	.081	.073	.240	
22	.076	.068	.012	.000	.000	.000	.000	.658	.076	.000	.000	.150	.000	.000	.060	.288	
23	.172	.135	.044	.009	.071	.071	.059	.216	.141	.071	.051	.115	.060	.083	.012	.072	.600
24	.199	.160	.083	.076	.059	.024	.024	.022	.145	.071	.062	.115	.034	.000	.000	.204	
25	.137	.178	.119	.101	.210	.000	.000	.232	.160	.037	.024	.112	.086	.036	.012	.204	
26	.106	.078	.058	.072	.000	.000	.000	.203	.049	.000	.000	.052	.000	.000	.000	.036	
27	.288	.132	.095	.162	.036	.012	.003	.241	.174	.090	.036	.085	.036	.059	.036	.060	.170
28	.212	.179	.151	.237	.036	.024	.000	.222	.174	.065	.022	.079	.099	.015	.086	.132	
29	.271	.156	.111	.257	.099	.029	.012	.224	.162	.042	.012	.111	.059	.057	.056	.180	
30	.033	.024	.081	.052	.000	.100	.028	.084	.000	.000	.000	.057	.000	.000	.000	.132	.320
31	.000	.000	.000	.000	.000	.000	.000	.047	.000	.000	.000	.000	.000	.000	.000	.012	.900
Sum	4.733	3.724	2.939	2.972	1.414	.811	1.102	4.979	2.528	.934	1.008	2.567	1.355	.816	.660	5.052	2.250
Mean	.197	.155	.122	.124	.059	.034	.046	.207	.105	.039	.042	.106	.056	.034	.027	.210	

TABLE I (Continued)—*Evaporation.* JUNE, 1901.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	.101	.075	.139	.024	.037	.071	.024	.000	.105	.084	.071	.055	.060	.063	.106	.096	.010
2	.109	.047	.023	.048	.048	.084	.024	.000	.084	.058	.084	.045	.070	.043	.048	.036	
3	.067	.035	.000	.012	.011	.022	.000	.000	.066	.000	.022	.037	.024	.000	.024	.120	.150
4	.000	.000	.000	.000	.000	.000	.000	.144	.000	.000	.000	.032	.000	.000	.000	.132	.180
5	.024	.158	.046	.047	.173	.129	.000	.034	.149	.166	.166	.062	.157	.153	.024	.180	
6	.280	.277	.048	.098	.040	.047	.000	.182	.155	.076	.071	.107	.104	.071	.012	.072	
7	.288	.153	.056	.079	.024	.035	.024	.230	.257	.059	.000	.053	.099	.047	.013	.204	
8	.384	.179	.091	.235	.030	.037	.037	.237	.171	.068	.044	.109	.124	.000	.038	.048	
9	.393	.288	.108	.097	.054	.129	.011	.244	.172	.081	.096	.106	.104	.047	.078	.348	
10	.199	.268	.207	.302	.190	.094	.000	.213	.157	.065	.086	.109	.097	.071	.000	.204	.410
11	.406	.064	.069	.069	.000	.000	.000	.074	.029	.000	.000	.089	.000	.000	.000	.168	
12	.300	.140	.112	.104	.083	.048	.047	.251	.136	.112	.097	.069	.146	.159	.047	.048	
13	.295	.150	.139	.161	.130	.082	.024	.174	.131	.012	.084	.019	.104	.098	.054	.216	
14	.087	.042	.032	.000	.000	.000	.000	.089	.012	.000	.000	.045	.000	.000	.000	.036	.910
15	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.084	
16	.140	.000	.013	.037	.047	.071	.061	.103	.084	.000	.060	.023	.048	.048	.119	.096	
17	.218	.107	.023	.058	.071	.047	.058	.076	.094	.099	.106	.053	.095	.060	.095	.060	
18	.215	.064	.012	.013	.024	.058	.071	.136	.041	.080	.047	.031	.024	.034	.059	.216	
19	.336	.069	.024	.034	.024	.047	.013	.134	.081	.058	.071	.068	.061	.059	.036	.360	
20																.432	
21	.122	.124	.057	.010	.059	.046	.000	.161	.124	.073	.024	.058	.063	.072	.000	.372	
22	.301	.164	.125	.109	.036	.004	.047	.206	.108	.053	.107	.091	.162	.051	.000	.336	
23	.366	.213	.213	.167	.000	.000	.023	.346	.167	.139	.092	.111	.162	.050	.000	.276	
24	.323	.221	.191	.257	.024	.019	.000	.285	.195	.107	.070	.139	.128	.171	.164	.252	
25	.299	.416	.213	.132	.026	.016	.024	.277	.182	.087	.012	.169	.130	.104	.035	.324	
26	.270	.374	.321	.129	.028	.000	.023	.239	.146	.121	.125	.148	.142	.097	.000	.240	
27	.318	.301	.264	.206	.078	.000	.035	.025	.157	.068	.081	.125	.115	.099	.041	.348	
28	.309	.305	.266	.135	.059	.006	.110	.233	.320	.102	.108	.146	.089	.110	.064	.204	
29	.293	.358	.307	.151	.078	.052	.000	.290	.146	.082	.110	.139	.130	.156	.118	.420	
30	.469	.308	.467	.228	.022	.087	.023	.192	.109	.078	.000	.128	.099	.064	.060	.252	.070
Sum.	7.412	4.900	3.162	2.942	1.396	1.231	.679	4.377	3.578	1.928	1.834	2.366	2.537	1.927	1.235	6.180	1.730
Mean	.247	.163	.105	.098	.046	.041	.023	.145	.119	.064	.061	.078	.084	.064	.041	.206	

TABLE I (Continued)—*Evaporation.* JULY, 1901.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	.273	.274	.266	.267	.087	.012	.024	.254	.166	.060	.073	.110	.101	.070	.121	.336	
2	.284	.323	.183	.099	.047	.038	.023	.175	.145	.058	.036	.124	.098	.139	.151	.120	
3	.274	.356	.167	.138	.057	.055	.004	.249	.185	.088	.087	.113	.137	.102	.083	.516	
4	.352	.371	.378	.190	.058	.106	.007	.291	.214	.154	.118	.143	.139	.124	.115	.348	
5	.572	.308	.367	.156	.130	.011	.011	.223	.208	.070	.068	.136	.127	.095	.095	.288	
6	.286	.246	.251	.164	.045	.019	.012	.273	.127	.067	.111	.144	.131	.159	.011	.312	
7	.172	.487	.280	.113	.112	.000	.012	.205	.150	.144	.572	.136	.088	.124	.012	.396	
8	.320	.302	.195	.146	.113	.108	.024	.021	.129	.085	.159	.148	.153	.000	.026	.348	
9	.233	.262	.182	.069	.067	.000	.012	.167	.119	.064	.036	.112	.054	.078	.064	.096	
10	.164	.183	.162	.059	.054	.063	.037	.158	.121	.045	.007	.064	.065	.064	.000	.024	
11	.272	.226	.250	.143	.025	.075	.001	.226	.149	.074	.040	.101	.120	.064	.051	.252	
12	.296	.300	.215	.101	.026	.132	.036	.248	.130	.099	.081	.127	.137	.101	.112	.240	
13	.224	.272	.220	.199	.211	.050	.013	.220	.246	.127	.129	.010	.088	.128	.001	.336	
14	.233	.272	.304	.083	.071	.024	.046	.206	.134	.039	.097	.120	.178	.089	.109	.288	
15	.134	.064	.060	.027	.213	.037	.000	.072	.000	.198	.110	.080	.000	.059	.097	.360	.320
16	.302	.206	.082	.078	.087	.102	.064	.012	.138	.269	.157	.111	.108	.000	.000	.276	
17	.323	.194	.125	.101	.099	.141	.101	.107	.178	.280	.257	.152	.174	.058	.054	.242	
18	.291	.465	.089	.061	.111	.157	.042	.125	.268	.326	.295	.129	.179	.080	.000	.456	
19	.283	.163	.077	.017	.093	.135	.121	.111	.280	.272	.112	.164	.166	.076	.043	.228	
20	.267	.182	.127	.101	.106	.132	.141	.130	.295	.310	.447	.116	.169	.048	.069	.348	
21	.214	.181	.127	.098	.131	.146	.129	.071	.334	.349	.218	.131	.090	.039	.065	.396	
22	.259	.185	.120	.061	.072	.141	.121	.073	.352	.347	.352	.201	.037	.097	.073	.348	
23	.249	.149	.088	.095	.078	.069	.101	.122	.319	.315	.104	.100	.071	.000	.000	.312	
24	.227	.155	.080	.073	.136	.098	.097	.106	.336	.265	.221	.169	.043	.070	.039	.240	
25	.170	.136	.062	.056	.071	.096	.081	.063	.239	.218	.190	.054	.066	.038	.060	.216	
26	.156	.124	.079	.065	.042	.096	.095	.043	.217	.243	.168	.117	.032	.070	.000	.336	
27	.218	.092	.071	.060	.053	.081	.048	.129	.251	.240	.181	.117	.058	.044	.044	.252	
28	.201	.145	.087	.065	.069	.101	.097	.075	.258	.221	.118	.057	.060	.069	.052	.252	
29	.206	.108	.080	.014	.949	.089	.089	.125	.274	.257	.172	.031	.031	.000	.065	.312	
30	.227	.150	.085	.118	.073	.112	.069	.091	.298	.278	.216	.392	.088	.058	.042	.276	
31	.395	.126	.090	.071	.060	.115	.071	.086	.276	.306	.215	.144	.035	.097	.032	.444	
Sum.	8.079	7.007	4.949	3.089	3.546	2.541	1.729	4.457	6.536	5.868	5.147	4.303	3.023	2.240	1.686	9.194	.320
Mean	.260	.226	.159	.099	.114	.082	.055	.143	.211	.189	.166	.139	.097	.072	.054	.280	

TABLE I (Continued)—*Evaporation.* AUGUST, 1901.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	.202	.172	.106	.090	.047	.065	.088	.096	.330	.300	.114	.082	.024	.000	.040	.384	
2	.165	.101	.098	.043	.054	.124	.061	.136	.276	.295	.229	.117	.045	.065	.012	.348	
3	.116	.093	.031	.079	.118	.060	.091	.032	.172	.167	.170	.135	.061	.019	.081	.120	.080
4	.181	.074	.035	.036	.049	.040	.014	.031	.249	.196	.133	.095	.025	.000	.032	.228	
5	.209	.108	.058	.051	.063	.114	.105	.066	.230	.208	.140	.074	.053	.070	.025	.096	
6	.101	.054	.023	.048	.054	.039	.041	.046	.139	.151	.117	.051	.042	.051	.063	.324	.120
7	.200	.093	.043	.000	.054	.026	.034	.037	.183	.173	.169	.047	.011	.043	.000	.168	
8	.194	.094	.022	.046	.047	.030	.016	.000	.170	.187	.118	.087	.013	.000	.000	.144	
9	.183	.111	.069	.053	.052	.075	.033	.043	.200	.196	.146	.061	.056	.058	.068	.228	.030
10	.156	.080	.000	.012	.155	.012	.000	.000	.081	.147	.094	.121	.000	.000	.000	.168	.100
11	.227	.177	.056	.012	.045	.044	.000	.012	.198	.174	.086	.056	.029	.032	.000	.168	
12	.254	.183	.074	.068	.047	.064	.026	.051	.252	.031	.103	.142	.056	.071	.018	.348	
13	.213	.156	.071	.085	.037	.085	.079	.116	.239	.181	.103	.106	.022	.025	.047	.228	
14	.219	.199	.099	.074	.061	.114	.049	.056	.259	.205	.121	.065	.061	.000	.018	.336	
15	.197	.145	.069	.077	.030	.069	.076	.058	.201	.217	.224	.088	.045	.046	.033	.216	.020
16	.161	.123	.040	.036	.038	.050	.085	.086	.176	.167	.110	.090	.031	.027	.040	.120	
17	.233	.129	.067	.078	.129	.054	.096	.069	.220	.227	.265	.071	.012	.041	.031	.264	
18	.218	.131	.075	.054	.031	.137	.069	.041	.465	.207	.152	.092	.099	.032	.039	.264	
19	.030	.000	.000	.000	.000	.000	.000	.000	.000	.000	.024	.000	.000	.000	.000	.048	.500
20	.139	.028	.109	.069	.045	.000	.038	.083	.091	.123	.071	.031	.036	.000	.000	.168	.030
21	.115	.069	.036	.000	.028	.024	.000	.036	.000	.101	.000	.000	.000	.000	.000	.072	.230
22	.109	.071	.071	.028	.028	.071	.071	.099	.099	.111	.043	.036	.059	.036	.000	.204	
23	.103	.083	.016	.000	.032	.037	.000	.000	.043	.083	.058	.000	.118	.047	.024	.060	
24	.182	.106	.074	.048	.031	.039	.059	.036	.123	.146	.054	.012	.036	.000	.012	.180	
25	.163	.136	.052	.036	.046	.090	.024	.012	.148	.144	.082	.078	.012	.012	.012	.132	
26	.179	.120	.047	.012	.031	.058	.000	.000	.187	.144	.087	.193	.000	.000	.000	.156	
27	.148	.106	.034	.000	.048	.055	.056	.058	.157	.139	.129	.118	.177	.061	.000	.096	
28	.159	.114	.055	.000	.058	.079	.033	.033	.163	.155	.125	.078	.140	.000	.033	.132	
29	.183	.157	.036	.039	.026	.064	.030	.012	.205	.161	.086	.132	.057	.032	.000	.120	
30	.094	.053	.012	.000	.041	.059	.047	.047	.128	.107	.073	.046	.049	.040	.000	.132	
31	.154	.112	.031	.044	.124	.037	.035	.067	.139	.143	.076	.082	.030	.000	.052	.132	
Sum	5.187	3.376	1.609	1.218	1.649	1.815	1.356	1.459	5.523	4.986	3.502	2.386	1.999	1.340	.680	5.784	1.110
Mean	.167	.109	.052	.039	.053	.058	.043	.047	.178	.161	.113	.077	.064	.043	.022	.187	

TABLE I (Concluded)—*Evaporation.* SEPTEMBER, 1901.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	.160	.100	.064	.060	.038	.058	.062	.021	.188	.173	.151	.126	.050	.081	.000	.144	
2	.187	.164	.060	.049	.043	.044	.141	.100	.235	.168	.112	.080	.027	.012	.000	.264	
3	.131	.080	.030	.000	.043	.065	.012	.000	.015	.144	.167	.094	.070	.055	.039	.060	.09
4	.157	.105	.057	.049	.043	.037	.000	.000	.169	.148	.104	.054	.029	.045	.047	.144	
5	.159	.119	.079	.000	.035	.065	.086	.082	.183	.164	.086	.087	.079	.000	.000	.216	
6	.195	.132	.052	.046	.039	.065	.045	.015	.220	.187	.108	.031	.037	.047	.000	.300	
7	.180	.110	.061	.065	.030	.094	.042	.062	.198	.192	.147	.188	.086	.032	.036	.156	
8	.164	.130	.067	.051	.045	.065	.080	.043	.194	.181	.115	.061	.000	.044	.012	.228	
9	.017	.117	.083	.064	.035	.119	.052	.060	.207	.194	.136	.129	.088	.051	.012	.204	
10	.134	.093	.022	.060	.014	.069	.037	.035	.166	.170	.108	.089	.043	.035	.028	.192	
11	.193	.101	.069	.000	.053	.081	.065	.050	.194	.183	.119	.056	.023	.033	.026	.240	
12	.142	.089	.057	.042	.022	.078	.051	.047	.174	.017	.151	.041	.045	.033	.019	.180	
13	.146	.110	.052	.017	.039	.099	.055	.023	.137	.171	.101	.088	.055	.025	.022	.216	
14	.155	.073	.030	.053	.101	.066	.022	.012	.176	.146	.101	.067	.000	.000	.028	.132	
15	.211	.137	.074	.032	.039	.101	.036	.058	.200	.198	.151	.091	.086	.048	.027	.264	
16	.172	.072	.050	.034	.052	.090	.047	.037	.178	.155	.088	.078	.000	.042	.029	.168	
17	.144	.086	.036	.069	.030	.063	.038	.069	.151	.154	.102	.046	.041	.048	.037	.204	
18	.142	.089	.047	.000	.024	.101	.032	.027	.151	.152	.129	.086	.036	.040	.037	.120	
19	.147	.086	.040	.038	.030	.054	.015	.012	.159	.141	.129	.076	.012	.024	.000	.120	
20	.165	.070	.018	.005	.037	.053	.040	.029	.163	.154	.091	.062	.017	.000	.036	.312	
21	.150	.078	.059	.000	.000	.099	.046	.024	.165	.168	.120	.028	.026	.067	.000	.252	
22	.235	.097	.058	.075	.047	.073	.053	.054	.185	.218	.108	.121	.030	.000	.036	.192	
23	.188	.302	.039	.067	.037	.097	.041	.000	.183	.174	.153	.086	.000	.039	.054	.276	
24	.177	.248	.061	.015	.104	.029	.000	.118	.211	.138	.117	.044	.067	.073	.000	.240	
25	.172	.000	.093	.054	.018	.116	.032	.000	.174	.162	.131	.060	.000	.000	.037	.228	
26	.179	.069	.082	.000	.019	.082	.054	.060	.138	.150	.069	.047	.032	.039	.126	.216	
27	.151	.097	.091	.063	.028	.106	.065	.000	.129	.155	.101	.050	.050	.041	.000	.192	
28	.124	.064	.051	.069	.035	.069	.000	.074	.108	.137	.071	.045	.000	.000	.022	.132	
29	.160	.074	.060	.034	.049	.095	.056	.000	.156	.138	.030	.062	.056	.041	.000	.180	
30	.194	.090	.080	.028	.000	.123	.000	.065	.186	.139	.141	.055	.067	.046	.011	.120	
Sum.	4.831	3.182	1.692	1.139	1.129	2.356	1.305	1.177	5.093	4.663	3.437	2.770	1.152	1.041	.621	5.892	.09
Mean	.161	.106	.056	.038	.038	.078	.043	.039	.169	.155	.115	.092	.038	.035	.021	.196	
Mean for 5 months	.206	.152	.099	.077	.062	.059	.042	.116	.156	.121	.099	.098	.068	.049	.033	.216	

TABLE II—*Per cent of Alkali.*

Depth in inches	8	9	10	11	12	13	14	15
3	.1232	.4972	.6144	1.48	.2076	1.7916	.9724	1.2492
6	.1044	.2176	.2728	.5560	.1924	.7048	.6104	.6708
9	.0360	.1348	.1552	.3000	.1928	.4048	.5824	.5904
12	.0480	.1516	.2048	.2316	.2244	.2544	.5596	.5752
15	.0472	.0912	.2660	.1360	.2236	.2468	.3784	.5000
18	.0404	.0380	.2064	.1688	.2648	.2168	.4180	.5140
22	.0376	.0316	.2064	.3224	.2616	.2344	.2924	.4024
25	.0412	.0360	.1796	.3256	.1400	.2392	.4904	.4620
Sum	.4780	1.1980	4.3040	4.9640	1.7072	4.0928	2.1156	3.5205
Mean	.0597	.1497	.2644	.4401	.2134	.5116	.5375	.6205

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